MXene-TMDs Based Hybrids for Energy Storage Applications

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The synthesis and application of MXenes in supercapacitors represent a focal point of research in our laboratory, driven by the pursuit of high-performance energy storage solutions. MXenes, a class of 2D transition metal carbides, nitrides, and carbonitrides, have emerged as promising materials for supercapacitor electrodes due to their unique combination of properties. Our research endeavors begin with the synthesis of MXenes, wherein we employ various selective etching methods to exfoliate MAX phase precursors, yielding MXene nanosheets with tailored surface chemistry and structural properties and synthesizing hybrid with transition metal dichalcogens (MoS_2, VS_2, VTe_2 etc). This integration of TMDs and MXenes in hybrid structures offers a promising approach to develop advanced electrode materials with enhanced performance for energy storage devices, including supercapacitors and batteries. Our investigations aim to elucidate the influence of TMDs/MXene hybrid synthesis parameters, electrode architecture, and electrolyte composition on the energy storage performance of supercapacitors. Through systematic optimization, we strive to achieve superior electrochemical properties, including high specific capacitance, excellent rate capability, and long-term cycling stability. Overall, our research endeavors underscore the significance of MXenes/TMDs hybrid in advancing the frontier of supercapacitor technology, offering insights into materials synthesis, electrode design, and device engineering for high-performance energy storage applications.

References

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